

Product Bulletin

Wireless Speaker System Reference Design

With TI's reference design for a wireless speaker system manufacturers of home-theaters-in-a-box, micro- and mini-component stereo systems and other consumer electronics products can quickly bring new audio products to market that eliminate much of the wiring hassles for consumers. At the same time, the transmitter design and receiver design produce high-fidelity sound that is richer than many wired sound systems.

By incorporating TI's four-channel, high-resolution TAS5504 digital audio processor with

integrated PWM processor in the receive module, manufacturers can rapidly deploy preconfigured audio processing functions and enhanced sound algorithms from TI and third parties. A wide variety of algorithms and functions such as loudspeaker normalization, second-order tone control, triple-slope dynamic range compression, auto mute, 3D sound, virtual surround sound and various loudness curves are readily available.

In addition to the TAS5504, the receive module also features TI's TAS5142, a high-performance

integrated stereo digital amplifier power stage capable of driving up to 100 W per channel. The receive module has been design for a bi-amp speaker with both the woofer and tweeter in the same unit and crossover is done in the TAS5504.

Partnering with Eleven Engineering

Both the transmit and receive modules feature the Squeak digital wireless audio platform from Eleven Engineering, a leading developer of wireless processors. The Squeak platform integrates a 2.4-GHz, 1536-kbps FSK digital radio solution and the XInC wireless baseband processor with a MAC protocol and dynamic error correction functions. The XInC wireless baseband, a 16-bit RISC processor streamlined for wireless speakers with eight hardware threads, accepts and sends 48-KHz digital audio input/output. The system can also be configured for analog-to-analog with TI's PCM1807 stereo analog-to-digital converter (ADC) on the transmit module. The PCM1807 converts analog audio input signals into digital PCM data that is

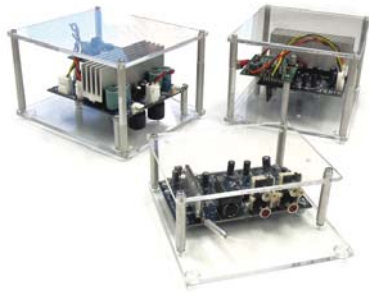
Key Benefits

- Eliminates wiring requirements from media players to speakers for wireless rear speakers
- DVD- and CD-quality sound even in the presence of interference sources (microwave ovens, 802.11b/g networks or cordless phones)
- TAS5504 processor enables easy deployment of enhanced sound coefficients
- Highly integrated TAS5504 processor lowers bill of materials (BOM) costs by eliminating passive components
- Meets requirements for Dolby® certification
- One transmitter can send audio to two receivers
- Available control channel sends I²C commands to all units in the system to adjust a variety of system settings

Matrix of Link Specs

Frequency band	2.4-GHz ISM band (2.40 – 2.48 GHz)
Interference avoidance algorithm	Frequency hopping
Transmission method	Hybrid FEC/ARQ with AFH
Output power	14 dBm (19 dBm with 160' range)
Range	80' or 160' (25 or 50 m) indoors
Concurrent systems	Up to 6 transmitters in 160' (50 m) range
Wireless baseband	XInC wireless processor, 16-bit, 8 hardware threads, 49.152 MHz
RF transceiver	ML2724, 2.4 GHz, 1.5 Mbits/s
Audio sampling	16-bit per channel (up to two channels) 48 kHz
SNR	92.4 dB full scale @ 997 Hz
THD+N	0.062% (997 Hz @ -1 dB full scale)
Audio bandwidth	20 Hz to 20 kHz
Mute	Auto mute when signal lost

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compressed and packetized by the baseband processor before the packets are passed on to the RF module for transmission. The Squeak protocol also incorporates a duplex-control channel to send I²C commands directly to the TAS5504 on either receiver or transmitter. This ability allows for simple commands, such as volume control, or complex commands, EQ settings and crossover parameters, to be sent from any unit in the system to evoke system level changes.

Squeak has advanced error protection build into its protocol, with hardware forward error correction and adaptive frequency hopping, to ensure the most robust quality of service. Thus, the system is able to effectively avoid potential sources of interference in the 2.4-GHz ISM band, such as cordless telephones, 802.11b/g Wi-Fi networks and microwave ovens; and still deliver low-latency performance. In fact

the wireless speaker system reference design is Dolby® certifiable with a low latency of less than 20 milliseconds. Depending on the RF module configuration, the reference design's robust quality of service can be achieved at ranges of 80' or 160' (25 or 50 meters).

Comprehensive Digital Audio Components

TI offers a complete suite of digital audio technology which gives manufacturers the freedom to design a broad range of systems that meet a variety of cost and performance targets. Many functions previously unrealizable or available only through analog components are now performed in the digital domain with a new level of ease and flexibility.

TI's audio components offer manufacturers the widest dynamic range and exceptional sound fidelity along with highest degree of integration to simplify system design. The company's portfolio of audio devices range from digital audio processors developed specifically for audio signal processing functions to an industry-leading line of digital signal processors (DSPs) for decoding specific algorithms as well as the audio industry's most extensive selection of digital audio amplifiers.

TI has earned a reputation for the extensive resources that support manufacturers' custom

Key Features

- Four-channel TAS5504 with integrated 48-bit digital audio processor and four-channel high-resolution PWM processor
- High-performance TAS5142 stereo digital amplifier power stage
- Digital baseband processor based on proven XInC wireless processor from Eleven Engineering
- PCM1807 16-bit stereo analog-to-digital converter
- Robust frequency hopping interference avoidance algorithm ensures low sound latency
- Dolby® certifiable for low latency (less than 20 milliseconds)
- Squeak digital wireless audio platform integrates RF physical layer, baseband, MAC protocol and dynamic error correction functions
- Available duplex-control channel for sending commands from any unit in the system to all units
- Two receivers may be concurrently connected to a single transmitter

design projects. The company has implemented a focused design and support model comprised of engineering, production, manufacturing and sales personnel. Many leading audio manufacturers have taken advantage of TI's extensive support for its portfolio of digital audio technology to deliver their products to the fast paced consumer electronics marketplace. For more information, visit www.ti.com/homeaudio.



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